

Identification and Development of User Requirements to Support Robust Corridor Investment Models

Research Development and Technology

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The purpose of the project was to develop useable techniques to integrate a broader range of potential impacts of transportation investments into transportation planning and decision-making. The research project described in this report developed a multi-attribute framework that can be used to assist in organizing and synthesizing information to measure costs and benefits, both monetary and non-monetary, of highway corridor investments. A modular approach was taken to developing individual techniques to quantify the potential impacts that could be utilized within the framework. The framework is flexible enough to accommodate the incorporation of additional techniques over time. To determine the range of potential impacts to consider, the values and needs of various stakeholders in highway corridors were taken into account and incorporated into variables, or indicators, to be used in a comprehensive system for evaluating impacts, costs, and benefits. Example techniques include a consideration and demonstration of the utility of geographic information systems (GIS) to organize data for use with the hedonic land valuation method. A prediction map was generated from this process, indicating the price consumers are willing to pay for a house in relation to its location with respect to highway corridors. This information is useful in analyzing the impact of competing corridor alternatives. In order to measure other indicators, the project also assessed the utility of high-resolution satellite remote sensing (RS) image data to provide highly accurate inputs necessary for economic models and as a means of measuring success after investments have been made. A methodology was developed to identify commercial and industrial origins and destinations from impervious surfaces. This, in turn, was translated into a calculation of average travel distances that could be used to quantify accessibility impacts associated with corridor alternatives. Remote sensing and GIS were assessed because of the spatial nature of transportation investments and their potential as a measuring tool for the transportation indicators. This multi-attribute framework is consistent with

the Missouri Department of Transportation's (MoDOT's) overall planning direction of including the perspectives of more individuals/groups and potential impacts in decision making. This overall planning direction is seen in the Planning Framework and the Long-Range Transportation Plan (LRTP).

Specific findings of the Project are:

(1) An Advisory Panel of transportation stakeholders provided information that was processed into a list of measurable indicators of the nature of the impacts. The value of the indicators for a given transportation alternative can be used in decision making to select alternatives that provide the most overall benefits.

(2) A conceptual framework for assessing the benefits of alternative highway corridor (and other) investments strategies was developed in order to compare the benefits of transportation investments in general and between various alternative corridors. The overall framework is comprehensive and explicit. It is also ambitious—too ambitious to implement in full immediately. But it is also modular in nature. The framework outlines a long list of indicators and suggests ways in which some of them can be measured. This project includes the development and demonstration of two specific techniques to quantify indicators. The framework is immediately useful as a general guide for policy and investment strategies. As a guide for quantitative analysis of investment benefits, it is not immediately applicable in full. However, some of the indicators can and should be estimated on a regular basis beginning immediately.

(3) IMPLAN is recommended as the tool for MoDOT's internal use to assess the economic impacts of transportation investments. Other models, such as the REMI model may be preferred if the work is contracted.

(4) High-resolution satellite remote sensing data can provide useful information to quantify indicators, and a methodology was developed to identify commercial and industrial origins and destinations. This, in turn, was translated into average travel distances that could be used to quantify accessibility impacts associated with corridor alternatives. Many other applications, particularly in the environmental area, are anticipated.

(5) The combination of economics, statistics, and GIS led to a consideration and demonstration of the utility of GIS to organize data for use with the hedonic statistical method. A dynamic prediction map was generated from this process, indicating the price consumers are willing to pay for a house in relation to its location with respect to highway corridors. The results generated from this procedure have numerous applications: (a) it can assess the contribution to potential economic growth and development of infrastructure investments; (b) it can be used to determine optimum levels of public service provision within rural or urban communities; (c) it helps to evaluate people's perception of value with respect to various housing characteristics, such as conditions and qualities of the house, size of land parcel, number of bedrooms, distance to nearest highways, or distance to nearest streams and public parks; and (d) it provides transportation decision-makers and stakeholders with quantitative and visualized analysis tools to allocate limited economic resources properly.

Based on this project, the authors recommend that the Missouri Department of Transportation consider the following actions:

1. That the Department adopts a master framework for evaluating investments in transportation. This framework embodies the theme, "Missouri Department of Transportation Builds Communities."
2. That the Department evaluates Group Expert Choice as a means to eliciting the preferences of state residents. This approach would become part of the Department's program for stakeholder involvement and the regionalization of policies. This approach should consider the differential preferences of various regions and stakeholder groups in the state.
3. That the Department adopts the IMPLAN economic impact assessment system as a central component in the implementation of the master framework.
4. That the Department forms a stakeholder advisory panel to develop an implementation plan for the master framework. This implementation plan will include:

- a. a short-list of indicators to be included in the initial evaluation system,
 - b. prioritization of indicators for future incorporation into the system,
 - c. proxy benefits and costs based on the benefit-transfer approach described in this report,
 - d. a plan for the development of Missouri-specific evaluation procedures over time, and
 - e. a procedure for weighting the transportation preferences of various stakeholder groups and various regions of the state.
5. That the Department develops an educational program to inform state residents of their broad mission and the many benefits flowing from transportation. This educational program should:
- a. inform state residents that their preferences for transportation investments are considered in this framework,
 - b. incorporate the preference elicitation process (Group Expert Choice), and
 - c. include a package of demonstration material which educates residents about the role of transportation in their communities.
6. That the Department adopts the goal of becoming a learning organization. Achievement of this goal will involve the following activities:
- a. Integration of the Department's many data into a spatially articulated and easily accessed information system,
 - b. use of the global positioning system (GPS), remote sensing, and distributed data collection techniques for the collection of data,
 - c. use of geographic information systems (GIS) for most data organization and analysis,
 - d. use of GIS, visual simulations, and e-government techniques for public education programs,
 - e. integration of information and knowledge into every decision, and
 - f. development of the capacity to measure additional indicators as identified by the Advisory Panel.

These recommendations are consistent with the concept of the Department's Long Run Transportation Plan. Recommendation 4, in particular, describes a process whereby the Department can formalize the process of stakeholder involvement and integrate the process into its priority setting and investment process. This approach is particularly important when the resources available are unlikely to ever approach those necessary to achieve all demands on the system. This approach incorporates both the trade-offs between goals, and the absolute constraint on fiscal resources.

For More Information

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